ABSTRAK

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Program Studi : Teknik Elektro

Judul Skripsi : Studi Pengembangan *Express Feeder* pada Jaringan Distribusi untuk Mengurangi *Drop* Tegangan Menggunakan *Particle Swarm Optimization* (PSO).

Drop tegangan merupakan salah satu persoalan utama pada sistem distribusi yang dapat menurunkan kualitas tegangan. Penelitian ini bertujuan mengurangi drop tegangan pada penyulang CLDG melalui pengembangan e*xpress feeder* menggunakan metode *Particle Swarm Optimization* (PSO), sehingga sesuai standar batas toleransi drop tegangan sebesar 5% yang ditetapkan dalam SPLN 72:1987. Penyulang CLDG bertipe radial sepanjang 32,75 km dengan sebaran beban di sepanjang jaringan. Simulasi dilakukan menggunakan metode aliran daya *Backward Forward Sweep* (BFS) di MATLAB R2023b dan divalidasi dengan ETAP 19.0.1. Hasil menunjukkan lokasi optimal *express feeder* berada antara bus B01 (GI) dan B18 (KPN), dengan LBS baru ditempatkan di bus B17 (CSKR). Pengembangan ini menurunkan *drop* tegangan maksimum dari 9,86% menjadi 6,67% dan mengurangi bus kritis dari 52 menjadi 16. Uji lima skenario pemutusan jaringan menunjukkan bahwa *express feeder* mampu meningkatkan tegangan minimum dan menurunkan *drop* tegangan saat kondisi gangguan atau pemeliharaan.

Kata Kunci: *Backward Forward Sweep*, *Drop* Tegangan, *Express Feeder*, *Particle Swarm Optimization*

ABSTRACT

Name : Dendi Syaepul Alam
Study Program : *Electrical Engineering*
Title : *Study of Express Feeder Development in Distribution Networks to Reduce Voltage Drop Using Particle Swarm Optimization (PSO)*

Voltage drop is one of the main problems in distribution systems that can reduce voltage quality. This research aims to reduce the voltage drop on the CLDG extension through the development of express feeders using the Particle Swarm Optimization (PSO) method, so that it meets the voltage drop tolerance limit of 5% set in SPLN 72: 1987. The CLDG feeder is a radial type with a length of 32.75 km with load distribution along the network. Simulations were conducted using the Backward Forward Sweep (BFS) power flow method in MATLAB R2023b and validated with ETAP 19.0.1. Results show the optimal location of the express feeder is between buses B01 (GI) and B18 (KPN), with the new LBS placed at bus B17 (CSKR). This development decreased the maximum voltage drop from 9.86% to 6.67% and reduced the critical buses from 52 to 16. Tests of five network disconnection scenarios showed that the express feeder was able to increase the minimum voltage and decrease the voltage drop during fault or maintenance conditions.

Keywords**:** *Backward Forward Sweep*, *Express Feeder, Particle Swarm Optimization, Voltage Drop*